International Comparisons of Real Estate E-nformation on the Internet

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Abstract

How much information should brokers supply on a website? The Internet allows brokers to reduce the cost of providing information to potential buyers. However, brokers may risk disintermediation if they provide too much information. This paper presents a model of a broker's choice of how much information to provide on a website. The model considers buyers' tradeoffs between hiring a broker and gathering information on their own. It then investigates why real estate brokers in different countries provide different amounts of information on websites. Tests reveal that information provided on broker websites depends on the search cost of prospective buyers.

Introduction

Real estate brokers can utilize the Internet to reduce the cost of providing information to potential buyers. The upside for the broker is that buyers can match with sellers and self-select properties they are interested in and reduce the time and cost a broker must spend identifying and showing properties to the buyer. Moore (2000) states: ''A better-informed consumer leads to a more productive agent, which can save time and money for the real estate company.'' The broker essentially transfers the cost of the time to select properties to the potential buyer. However, a downside may exist if the potential buyer sees an opportunity to cut out the broker and attempts to locate and purchase the property, thus saving the broker's commission charges. A broker may risk disintermediation if too much information is provided. For example, almost no real estate websites provide property addresses. The likely reason is that buyers could seek out the seller on their own and cut out the broker.

What are the risks of the Internet for real estate brokers? What factors are important in weighing these risks? These are questions that are of great interest to the brokerage industry. Exploring theoretical and empirical models of the potential of the Internet to reduce both broker income and the demand for brokerage services are important tasks for researchers. This paper takes an important step in this research with a formal analysis of the factors that may

influence a real estate broker's decision on how much information to provide on a website. The contribution of this study is in developing and testing a theoretical model that demonstrates the tradeoffs a broker faces in developing a website. The model identifies and subsequent testing verifies that a key factor in determining how much information a broker should provide on a website is the search cost of prospective buyers.

Literature Review

The previous literature on real estate brokerage and the Internet has examined (1) the direct benefits and costs to brokers of the new technology of the Internet and (2) the potential indirect cost of broker disintermediation. Much of the literature seeks to advise real estate brokers on how they can most effectively utilize the Internet. Most of these papers address the impact of wide availability of information via the Internet on the conduct of real estate brokerage. However, there has been little more than a discussion of the potential of the Internet for broker disintermediation. Only recently have researchers started to formally characterize factors that may contribute to broker disintermediation.

The concern about disintermediation is reflected quite well in a mock discussion in Guttery, Baen, and Benjamin (2000): ''The fear mongers' theory is simple: If buyers and sellers can sit at their computers and gather enough information about each other's offerings—and even make offers—why should they pay real estate brokers?'' Tse and Webb (2002) echo this concern: ''With the advance of technology, it is possible that the Internet would enable information sharing and the bypassing of traditional information structures.'' Tse and Webb point to the need for more research on understanding the costs of an Internet presence for a broker. An important cost to consider in evaluating the potential of the Internet for disintermediation of brokerage services is a buyer's search cost. The important issue is whether the Internet reduces buyer search cost to a level that is lower than the brokerage fee. If so, the buyer will conduct the search and will have no need for a broker.

Baen and Guttery (1997) assert that, prior to the development of recent technologies, the cost of acquiring information previously led buyers to use brokers in real estate transactions. They and Tucillo (1997) argue that the reduction in information costs afforded by new technologies such as computers and easily available databases will lead to lower costs per transaction and a need for fewer brokers. Unlike Benjamin and Chinloy (1995) who contend that technology increases sale price, Baen and Guttery argue that lower transaction costs will result in an income transfer from brokers to sellers and buyers.

Guttery, Baen and Benjamin (2000) pose their concerns about broker disintermediation as: ''If information is power and if more information about real estate markets is available to the general public through technology, these

technological changes signal a transfer of power to consumers that will devalue information and services previously available only through REALTORS®, their associates and other real estate sales licensees. The industry may be close to imploding as it faces the challenges of new vehicles such as the Internet for disseminating real estate information.''

Miles (2000) offers the ''two real estate dot-coms'' theory that builds on the ideas of Baen and Guttery (1997). The first real estate dot-com world will evolve with the question of how many brokers will remain as the Internet reduces the need for brokers. Miles addresses disintermediation in the commercial brokerage industry as: ''*The net* loves to cut out middlemen and reduce margins.'' The second real estate dot-com world will evolve as online real estate brokers choose the geography in which to most profitably extend their services. Well-financed brokerages will become increasingly concentrated and powerful. Miles asserts that above average growth will take place in preferred neighborhoods. On the other hand, disparities in income and education mean that less attractive geographies will be losers.

Stanfill (1999/2000) addresses the risk of disintermediation for commercial real estate brokers as the best way to beat the Internet is to join the Internet. Real estate brokers must simply accept the Internet as a way of doing business and find a way to maintain their value-add in the supply chain. In a survey of 150 brokers in Ohio, Muhanna (2000) seems to support Stanfill's contention by finding that the driver behind a broker adopting the Internet is the wish to attract new buyers and cut buyer acquisition costs as opposed to a simple fear of losing business. On the other hand, Muhanna cautions that brokers may be underestimating the threat posed by the Internet for broker disintermediation. Similar conclusions are reached in Aalberts and Townsend (1999), Crowston and Wigand (1999), Crowston, Sawyer and Wigand (2001), Jud and Roulac (2001) and Ford and Rutherford (2002).

Bond, Seiler, Seiler and Blake (2000) recognize that the Internet provides the least-cost method of providing real estate information. They argue that all realtors can remain competitive only if they offer their properties on the Internet. Bond et al. survey the Ohio real estate brokerage market for web usage. The survey finds that most brokers have their own websites or list properties on other sites and that soon all brokers will. The survey also indicates that the amount of information provided on real estate sites is increasing. Seiler, Seiler and Bond (2000) also determine that brokers have done a good job adopting information technology. Bardhan, Jaffee and Kroll (2000) reach an analogous conclusion and find that real estate brokers can reinvent themselves as a new kind of intermediary who can thrive in the Internet world.

This idea that embracing information technology can have positive net benefits for real estate brokers is empirically confirmed in Jud, Winkler and Sirmans (2002), Sirmans and Swicegood (2000) and Benjamin, Jud, Roth and Winkler

(2002a). Using data from the 2001 National Association of REALTORS® Profile of Residential Real Estate Brokerages, Benjamin, Jud, Roth and Winkler (2002a) focuses on the Internet and finds that the net income of residential real estate brokers increases with use of the Internet. Zumpano, Johnson and Anderson (2002) utilizes the 2000 National Association of REALTORS® Profile of Home Buyers and Sellers to examine the hypotheses that the Internet will affect broker income and/or the demand for brokerage services by empirically studying how the Internet impacts buyer search time and the intensity of buyer search. They find that the Internet reduces search time however search intensity actually increases. Buyers end up looking at more properties without extending search duration. Zumpano, Johnson and Anderson argue that as buyers become more efficient in identifying properties they are interested in, brokers can then focus their time on pursuing the most likely sales opportunities. The same argument is made by Ong, Miller and Chow (2002). Zumpano, Johnson and Anderson interpret their findings as support for the previous literature that advises brokers to expand their web presence in order to insure their survival as an intermediary in real estate transactions.

There are two important caveats to note in regards to the empirical findings that real estate brokers can benefit from using the Internet. The first caveat is that the aforementioned research is based on a relatively short-term effect of the Internet. Ford and Rutherford (2002) report the results of a 2000 survey of agents who listed properties on the North Texas Regional Multiple Listing Service. Findings include that 28% of the survey participants believe the Internet will negatively impact commissions in the short run while 53% believe there will be a negative impact in the long run. While findings of the short-term benefits of the Internet are encouraging, it is prudent to gauge the long-term potential of the Internet to reduce either broker income or the demand for broker services. The second caveat is that the aforementioned research has focused on real estate brokerage in the United States. Delcoure and Miller (2001) study how worldwide brokerage fees vary with information availability. They find that brokerage fees are lower in countries where trustworthy information is efficiently and openly provided. They use these findings to predict that real estate commission fees in the U.S. should fall to 5% in the next decade and to 2% or 3% within two decades. They also predict a reduction in the number of brokers, with the surviving brokers earning the same or more income than before.

The concern about broker disintermediation in the previous literature and the uncertainty about the long-term effects of the Internet on broker income points to a significant gap in the literature. An important question that needs to be addressed is: What factors should a real estate broker consider in determining the amount of information to provide on a website? Zumpano, Johnson and Anderson (2002) take an important first step by pointing to the need to consider buyer search cost. This paper takes the next step in analyzing how buyer search cost affect the amount of information provided on real estate websites around the world.

A Model of Real Estate E-nformation on the Internet

This section develops a theoretical model of real estate information provision on the Internet. The model leads to a testable hypothesis on the relationship between the amount of information provided on real estate websites and the likelihood that a buyer will disintermediate the broker and purchase the property because the Internet reduces the search cost.

Assumptions

The players include a real estate broker and a buyer who is seeking to purchase a home. The price of the home is given by P. The buyer has reservation price R for the home.

A seller is excluded to allow a focus on information that the broker may provide to the buyer. An implicit assumption of the model is that brokers do not restrict access to information provided on the Internet, an assumption consistent with reality at this time. If brokers could restrict information on the Internet to buyers who have signed exclusive representation agreements, then brokers would clearly supply all available information on the website. Locations that permit such exclusive representation agreements would be consistent with brokers providing more information on the Internet. However, no evidence was found of such restrictions on any real estate website.

The broker is paid a fixed-percentage commission rate represented by s. The broker incurs a fixed hourly cost of c to provide information to a buyer. The number of hours (h) a broker spends to inform a buyer depends on the amount of information (I) personally communicated to the buyer where h increases at an increasing rate with I, i.e., $h'(I) > 0$ and $h''(I) > 0$.

The broker can choose how much information to disclose about the home on a website. Information provided on a website (I_W) reduces the information (I) that the broker must personally provide the buyer about the real estate.

The broker's payoff (Π) if a home is sold is the commission less the cost of providing information to a buyer:

$$\Pi = sP - ch(I). \qquad (1)$$

The buyer's fixed hourly search cost to acquire information about potential properties is given by χ. The buyer can either spend time (t_B) in hours gathering information independently (I_B) or spend time (t_W) gathering information (I_W) from the broker's website, thus the total time spent gathering information (t) is given

by $t = t_B(I_B) + t_W(I_W)$. The time a buyer spends acquiring information increases with the amount of information gathered, *i.e.*, $t'_B(I_B) > 0$ and $t'_W(I_W) > 0$. Let I_T be the total information gathered by the buyer where $I_T = I_B + I_W$. The buyer must gather some fixed amount of total information ($\bar{I}_T$) in order to identify a home for potential purchase. Consistent with the previous literature, it is assumed here that information gathered by the buyer from the broker's website requires much less time than gathering the information independently. This means that $t(\bar{I}_T)$ decreases with I_W, *i.e.*, $\frac{\partial t(\bar{I}_T)}{\partial I_W} < 0$. The additional time spent by a buyer gathering information independently is likely to have diminishing returns, *i.e.*, $t''_B(I) > 0$. However, there should not be such diminishing returns associated with a buyer gathering information from a website. Thus, $t(\bar{I}_T)$ decreases at an increasing rate with I_W, *i.e.*, $\frac{\partial^2 t(\bar{I}_T)}{\partial I_W^2} > 0$.

The buyer's payoff (U) if a broker is used to buy a house is the reservation price less the purchase price of the real estate and the broker's commission:

$$U = R - (1 + s)P. \tag{2}$$

The buyer's payoff from independently searching for and buying a house is the reservation price less the purchase price of the real estate and the total cost of searching for information:

$$U = R - P - \chi t(\bar{I}_T). \tag{3}$$

The Model

Equations (2) and (3) lead to the conclusion that the buyer will choose to use a broker if transaction costs (the broker's fees) are less than the buyer's total cost to search for a home independently. This is represented as:

$$sP < \chi t(\bar{I}_T). \tag{4}$$

The broker's problem is to maximize the payoff by choosing the amount of information that is made available on the Internet:

$$\max_{I_W} \Pi = sP - ch(I) \tag{5}$$

subject to the buyer's participation constraint given by Equation (4).

Analysis of the Model

The broker's objective function of Equation (5) shows that profit increases as more information is provided on a website. With no constraints, the broker would provide all available information about listings on the website. However, Equation (4) introduces the possibility of broker disintermediation if the broker provides too much information on a website. Given the constraint, the broker will provide just enough information that the buyer will not choose to search for a property independently. Thus, the broker's optimal choice of the amount of information to provide on the website (I_W^*) is I_W where the constraint of Equation (4) is satisfied as an equality. This is represented as:

$$I_W^* = I_W : \chi t(\bar{I}_T) - sP = 0. \tag{6}$$

The broker's optimal choice I_W^* is represented in Exhibit 1.

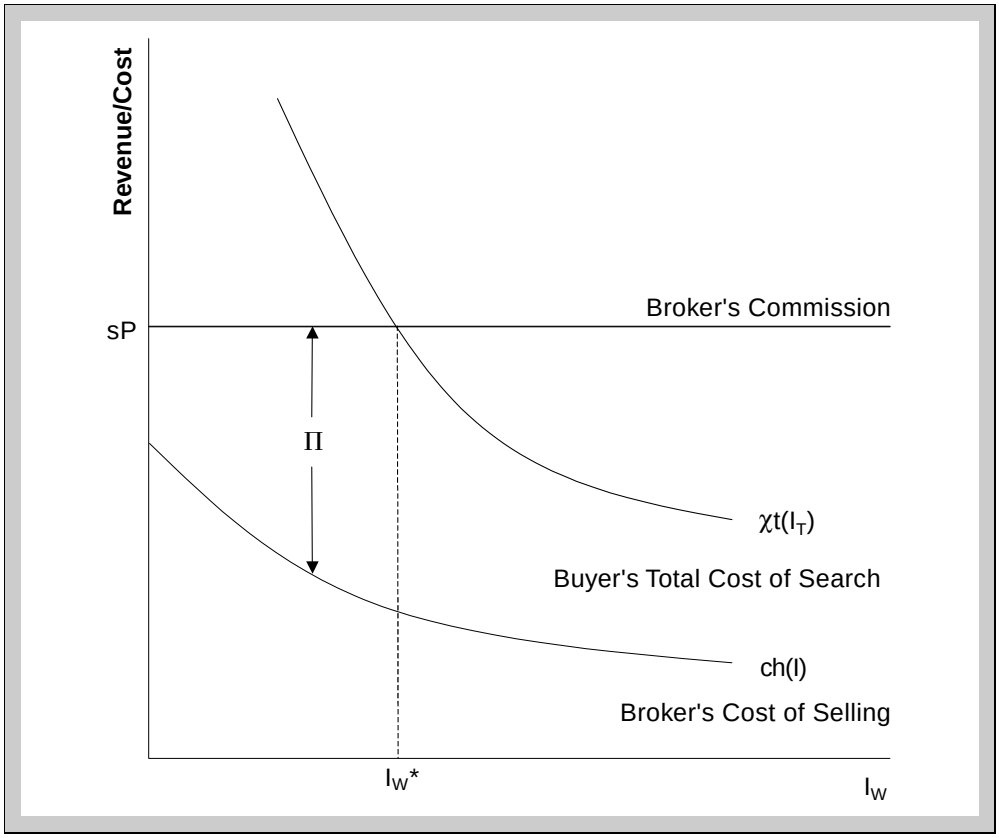
The question to consider now is does the information provided on the website vary with the buyer's search cost. Totally differentiating Equation (6) with respect to χ results in:

$$t + \chi \frac{dt}{dI_W} \frac{dI_W}{d\chi} = 0. \tag{7}$$

Solving Equation (7) for the change in website information with a change in buyer search cost yields:

$$\frac{dI_W}{d\chi} = -\frac{-t}{\chi \dfrac{dt}{dI_W}} > 0. \tag{8}$$

Exhibit 1 | The Broker's Choice of Website Information



Formulation of the Hypothesis

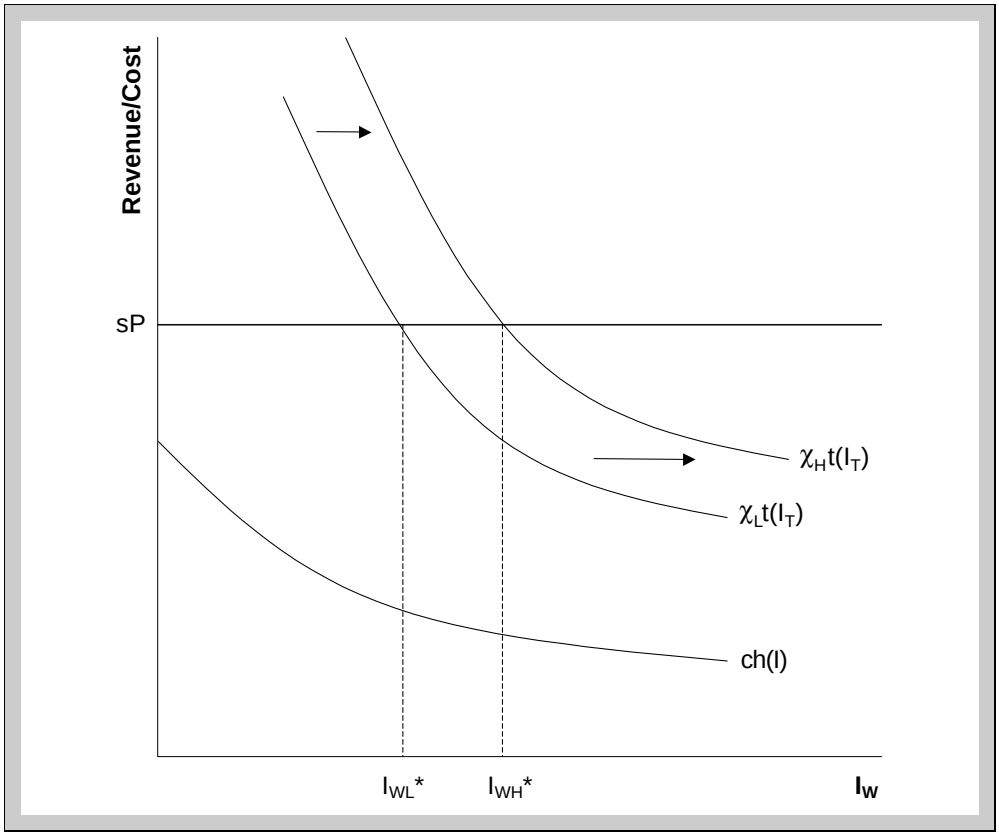
The result of Equation (8) is represented in Exhibit 2. An increase in buyer search cost from χ_L to χ_H increases the amount of information provided on the broker's website from I_{WL} to I_{WH}.

Equation (8) and Exhibit 2 imply the following hypothesis:

Hypothesis: Real estate brokers will provide relatively more information on their websites if their prospective buyers have relatively higher search costs.

Real estate brokers will provide more information in geographies characterized by buyers who have high search cost. This intuitively appealing idea is consistent with the claims of Miles (2000) that most growth of online brokerage will take place in preferred neighborhoods.

Exhibit 2 | Change in Information Provided on the Web Given a Change in Buyer Search Cost



Testing the Hypothesis

This section will test the hypothesis that follows from Equation (8). The tests will investigate why real estate brokers in different countries provide different types of information on e-commerce websites. The prediction is that more information will be provided on websites in countries where buyers have a high cost of search.

Alternative Explanations

The hypothesis of the previous section was based on individual differences between buyers. It may also be important to consider individual differences between firms. While significant demographic data is available that characterizes the average resident of a country, little international data can be found that

characterizes each country's average real estate firm. Thus, the opportunity to explore alternative explanations is limited by the availability of data.

One possible alternative explanation as to why real estate website information differs across countries is that the willingness of brokers to adopt new technology differs across countries. Muhanna (2000) tests the hypothesis that the likelihood a real estate broker will adopt the Internet depends on firm characteristics such as age, number of agents and sales. Muhanna finds that the likelihood increases with increases in the number of agents and sales. Firm age does not appear to matter. Seiler, Seiler and Bond (2001) find that the use of computers and software increases with brokerage firm size. Muhanna and Seiler, Seiler and Bond both find scale effects in Internet adoption. There may be similar economies of scale effects associated with country size. Proxies for country size such as gross domestic product (GDP) and population are readily available.

A second possible explanation is that real estate firm structure differs across countries. Bardhan, Jaffee and Kroll (2000) point out that Internet features such as a search tool, graphics, virtual tours and geographic reach are particularly important to real estate firms such as listing brokers and vacation rentals. While listing brokers can be found in almost every country in the world, vacation rentals are more likely to be found in countries that have resort areas. Countries with resort areas may have more real estate websites that provide more information simply because of the presence of vacation rentals. The Internet seems to be an ideal way to provide information on vacation rentals.

Exhibit 3 | Summary of Predictions from the Literature

Hypothesis	Supporting Literature
The Internet may lead to disintermediation of real estate brokers.	Baen and Guttery (1997), Tucillo (1997), Aalberts and Townsend (1999), Crowston and Wigand (1999), Stanfill (1999/2000), Bond, Seiler, Seiler and Blake (2000), Guttery, Baen and Benjamin (2000), Miles (2000), Muhanna (2000), Delcoure and Miller (2001), Crowston, Sawyer and Wigand (2001), Jud and Roulac (2001), Ford and Rutherford (2002) and Tse and Webb (2002)
Buyer search cost is an important factor in how the Internet will affect broker income and the demand for brokerage services.	Zumpano, Johnson and Anderson (2002)
Economies of scale exist in providing information on a real estate website.	Muhanna (2000) and Seiler, Seiler and Bond (2001)
Real estate websites are particularly useful for vacation rentals.	Bardhan, Jaffee and Kroll (2000)

The Empirical Model

Exhibit 3 summarizes the predictions of the literature and this paper that form the basis for the development of an empirical model that can be used to examine the provision of information on real estate broker websites.

The empirical model that follows from (1) the theorized relationship between the amount of information a broker provides on a website (I_W) and buyer search cost (χ), (2) a control for possible economies of scale effects (N) and (3) a control for vacation rentals (V) that is given by:

$$I_W = f(\chi, N, V), \tag{9}$$

where f describes some general functional relationship between the variables.

The Data

The Dependent Variable

The International Real Estate Directory (IRED) at http://www.ired.com lists and provides links to real estate websites around the world. An additional service provided by the IRED is that they score each website on a scale of 1 to 4 for information provision. The IRED has a special ''Spotlight'' score for the best websites that will be coded as a 5 for this study. The IRED rating criteria are shown in Exhibit 4. The data and rating criteria were obtained from the IRED website in September 2002.

For the purposes of this paper, only real estate websites classified by the IRED as ''companies that do business in a single country'' have been included in the study to allow matching of an IRED rating with a country-level measure of buyer search cost. A list of the countries available for this study and a summary of website ratings are shown in the Appendix.

There are several possible ways to represent the dependent variable of Equation (9). Candidates include the highest website score in each country, the number of websites in each country, the sum of the website scores for each country and the average or median website score for each country. While each of these alternatives will be examined in the testing that follows, using the highest website score seems the most intuitive. At any given time, only a small fraction of the population of any country would be in the market for real estate. Presumably, this relatively small pool of buyers could access any of the available websites in that country. It stands to reason that buyers would start their search with the websites that provide the most information and then supplement their search with information

Exhibit 4 | IRED Rating Criteria for Real Estate Websites

Score	Rating	Review
Spotlight (Coded as 5 for this study)		The Prime Location Spotlight puts the spotlight on those sites that are so compelling that even jaded website reviewers bookmark them for frequent reference. They generally meet all the highest design criteria, ease of use, aesthetics, quality of information and usefulness, but most of all they have compelling content. Prime Location is not just a rating, it is a commendation; a recognition that a site offers an advancement of the medium.
4	Excellent	Attractive and informative website. Uses the web as a medium well, as opposed to treating a website like a print ad. Strong, useful information for someone seeking real estate help.
3	Very good	Good presentation and/or information, with or without listings. Generally covers more than one subject or type of information.
2	Average	Average site. Is worth a look if you need an agent or are seeking property in that particular area.
1	Not ready	This includes sites that might be useful but which suffer from too many broken links, have no information at all, or are simply **too new to be useful** at the time of review. Needs plenty of work before it is of value to users.

Source: International Real Estate Directory website at http://www.ired.com.

on other websites as needed. The U.S. is a good example of this reasoning. Many buyers start at major websites that provide extensive amounts of information such as realtor.com or the large national brokerage firms. After focusing their search in an area of interest, buyers may then access the websites of local franchise or independent brokerage firms that typically provide much less information.

Using either the number of websites or the sum of the website scores as the dependent variable limits interpretation of the results because these variables only measure the overall quantity of information in a country and not the degree of informativeness (or quality) of an individual website. Using the average website score resolves the quantity/informativeness (quality) problem, however a new problem arises given the nature of the data. In the data, countries that have websites with high scores generally also have many websites with low scores. Thus, averaging most affects the countries with the highest rated websites. Averaging diminishes variance to a degree that it may be difficult to find a statistically significant relationship between average website score and any dependent variable.

The Independent Variables

Buyer search cost should ideally include both direct search expenses and the opportunity costs of search. Unfortunately, a measure of direct search expenses on a cross-country basis is not available. Thus, it is necessary to assume that variation in buyer search cost can be captured by the variation in the opportunity costs of search. In a cross-country setting, a buyer's opportunity costs of search can be proxied by a country's standard of living. One measure of standard of living is GDP per capita. In their U.S.-based study, Zumpano, Johnson and Anderson (2002) also choose to employ a measure of income as a proxy for a buyer's opportunity cost of search. Other economic proxies for the opportunity costs of search are age, education and homeownership rates. Each will be considered in turn in the testing that follows.

The control variable for possible economies of scale (N) associated with country size can be proxied either by GDP or population. The control variable for vacation rentals (V) is a dummy set to 1 if the country has any resort properties.

Gross domestic product per capita, age structure and population data were obtained from *The World Factbook 2002* published by the Central Intelligence Agency at http://www.cia.gov. Age structure is the percentage of the population in age ranges 1–14, 15–64, and 65 and over. Age structure 15–64 will be used as the proxy for the opportunity cost of search because that structure is associated with people that are of working age. Education is measured by school life expectancy as reported in the ''School Life Expectancy & Transition rate from primary to secondary (general programmes only), for school years 1998/1999 and 1999/2000'' statistical table released November 1, 2002 from the UNESCO Institute for Statistics at http://www.uis.unesco.org. Homeownership rates are measured by ''Owner %'' of ''Households in Occupied Housing Units'' in the ''Statistical Annexes to the Global Report on Human Settlements 2001, Table B-3 Ownership of Housing Units'' from the United Nations Human Settlements Programme at http://www.unhabitat.org. The IRED identifies countries that have real estates websites that serve ''resort or vacation properties.''

Empirical Methodology

The dependent variable is referred to as a ''rating'' by the IRED. However, one could argue that the IRED is really providing a ''ranking'' of the websites. Distinguishing whether the IRED score is a rating or a ranking is important for the choice of an appropriate statistical technique for the analysis. This paper will examine both alternatives.

Treating the IRED score as a ranking requires the use of statistical technique that estimates the relationship between an ordinal dependent variable and the set of independent variables. Maximum-likelihood ordered probit is an appropriate model if the error term is normally distributed. Expressing Equation (9) as an ordered probit model yields:

$$\Pr(I_{W,i} = j) = \Pr(\kappa_{j-1} < \beta_x \chi_i + \beta_N N_i + \beta_V V_i + \varepsilon_i \leq \kappa_j), \qquad (10)$$

where $\Pr(I_{W,i} = j)$ is the probability of observing a website score j, κ_j is cut point j and ε_i is a normally distributed error term. Estimations are made using a robust estimator of variance that allows for heteroscedasticity.

More conventional statistical techniques can be utilized if the IRED score is treated as a rating. Assuming Equation (9) can be represented as a linear relationship, the empirical model is specified as:

$$I_{W,i} = \alpha + \beta_\chi \chi_i + \beta_N N_i + \beta_V V_i + \varepsilon_i, \qquad (11)$$

where ε_i is a normally distributed error term. Equation (11) will be analyzed with a simple ordinary least squares model that first eliminates gross outliers and then uses a robust estimator of variance that allows for heteroscedasticity.

Results

Descriptive Statistics

Descriptive statistics for the four candidates for the dependent variable, the four proxies for buyer search cost, the two proxies for country scale and the resort area dummy variable are shown in Exhibit 5.

A point worth noting is that average score has a maximum value that is 1.67 less than the maximum value of highest score while the difference between the means is 1.13. It does appear that averaging most affects the countries with the highest rated websites. Averaging significantly reduces standard deviation, which may make it difficult to find a statistically significant relationship between average website score and the dependent variables.

Maximum-Likelihood Ordered Probit Estimation Results and Analysis

Exhibit 6 reports the estimated coefficients of Equation (10) using the highest website score as the dependent variable and five combinations of the proxies for buyer search cost and country scale along with the resort dummy variable as the independent variables. Tests do not indicate a violation of the assumption that the error term is normally distributed. Note that the other three candidates for the dependent variable (the number of websites, the sum of the website scores and

Exhibit 5 | Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Highest score	120	3.45	1.26	0	5
Number of websites	120	30.82	95.35	0	940
Total score	120	79.52	241.70	0	2,324
Average score	120	2.32	0.78	0	3.33
GDP per capita (thousands)	120	11.40	8.95	0.71	36.4
Age, 15–64	120	64.78	4.89	52.3	75.3
Education (years)	76	12.51	2.59	5	16.9
Ownership rate	44	66.00	15.94	3.9	90.6
GDP ($U.S. billions)	120	266.92	614.36	0.10	4,583.2
Population (in millions)	120	42.53	151.11	0.01	1,273.1
Resort area dummy	120	0.58	0.50	0	1

the average website score) are not ordinal rankings and thus cannot be used in an ordered probit model. The first set of independent variables is GDP per capita as a proxy for buyer search cost, GDP as a proxy for country scale and a resort area dummy variable. Findings are reported in results column 1 of Exhibit 6. Results columns 2 through 5 report findings for other combinations of the independent variables as indicated in Exhibit 6.

The results of Exhibit 6 provide significant support for the hypothesis that real estate brokers provide more information on their websites if prospective buyers have high search costs. As indicated in results columns 1, 3, 4 and 5, the data are robust to the choice of proxy for buyer search cost. One way to interpret the coefficients on the proxies for buyer search cost in Exhibit 6 is to examine how much the highest website score differs with the difference between the value of the proxy one standard deviation below the mean (the low search cost countries) and the value one standard deviation above the mean (the high search cost countries). For GDP per capita, this difference is 17.9 thousand. Given the coefficient on GDP per capita of 0.028 from Exhibit 6, the difference in the highest website score between a low search cost country and a high search cost country is 0.5. Thus, high search cost countries have, on average, a 0.5 better highest score website than do their low search cost counterparts. The mean highest website score for the low search cost countries is actually 3.2 whereas the high search cost countries is 3.8. The best real estate websites in low search cost countries are generally rated closer to ‘‘very good’’ whereas the best websites in high search cost countries are more likely to be rated ‘‘excellent.’’ An equivalent interpretation of the other measures of buyer search cost (age 15–64, education and home ownership rates) yields much the same results.

Exhibit 6 | Ordered Probit Estimation Results for Testing the Hypothesis

Independent Variable	Proxy	Results 1	2	3	4	5
	GDP per capita (thousands)	0.028 (0.036)	0.031 (0.002)	—	—	—
χ_i, Buyer Search Cost	Age, 15–64	—	—	0.058 (0.005)	—	—
	Education	—	—	—	0.093 (0.098)	—
	Homeownership rate	—	—	—	—	0.017 (0.060)
N_i, Scale	GDP (billions)	0.0003 (0.041)	—	0.0003 (0.024)	0.0002 (0.105)	0.0003 (0.033)
	Population (millions)	—	0.0008 (0.100)	—	—	—
V_i, Resort Dummy		1.695 (0.000)	1.716 (0.000)	1.785 (0.000)	1.705 (0.000)	1.671 (0.000)
Pseudo R^2		0.199	0.196	0.210	0.202	0.172

Note: Estimation Equation: $\Pr(I_{W,i} = j) = \Pr(\kappa_{j-1} < \beta_\chi \chi_i + \beta_N N_i + \beta_V V_i + \varepsilon_i \leq \kappa_j)$.
Ordinal Dependent Variable: Highest website score. The hypothesis is: Real estate brokers will provide relatively more information on their websites if their prospective buyers have relatively higher search costs. *p*-values are in parentheses under the point estimates.

The coefficients on both GDP and population are positive and significant in all cases. There is evidence of economies of scale in providing information on real estate websites at the country level. As results on scale effects are similar for all four proxies of buyer search cost and using GDP yields the highest R^2, results are reported for GDP only in results columns 3–5. The positive and significant coefficient on the dummy variable V_i confirms the idea that real estate brokers in countries with resort areas generally provide more information on their websites. The average highest website score for non-resort countries is 2.5 whereas the average for resort countries is 4.1. Real estate websites in countries with resort areas are, on average, rated ''excellent'' or better and their counterparts in countries that do not have resort areas are somewhere between ''average'' and ''very good.''

Ordinary Least Squares Regression Results and Analysis

Exhibit 7 reports the regression coefficients of Equation (11) alternatively using the highest website score, the average website score for each country, the sum of

Exhibit 7 | OLS Regression Results for Testing the Hypothesis

	Form of Dependent Variable			
Independent Variable	Highest Score	Average Score	Sum of Scores	Number of Websites
α, Constant	2.54 (0.018)	2.36 (0.000)	−1.85 (0.604)	−0.42 (0.756)
χ_i, Buyer Search Cost (GDP per capita)	0.023 (0.000)	0.001 (0.762)	0.873 (0.000)	0.346 (0.000)
N_i, Scale (GDP)	0.0002 (0.171)	−0.0001 (0.059)	0.0236 (0.000)	0.010 (0.000)
V_i, Resort Dummy	1.120 (0.000)	0.273 (0.002)	28.540 (0.000)	10.488 (0.000)
F	22.97	4.47	55.25	60.92

Note: The hypothesis is: Real estate brokers will provide relatively more information on their websites if their prospective buyers have relatively higher search costs. *p*-values are in parentheses under the point estimates.

the website scores for each country, and the number of websites in each country as the dependent variable. For ease of exposition, only the results with GDP per capita, GDP, and the resort dummy as the independent variables are reported. Using the other proxies for buyer search cost and scale yields similar results.

The results for highest score in Exhibit 7 are very similar to those of Exhibit 6. Buyer search cost, scale and resort status are all significant determinants of how much information is provided on real estate websites. The finding that real estate brokers provide more information on their websites if prospective buyers have high search cost appears robust to the specification of the empirical model. Using sum of scores or number of websites as the dependent variable leads to the same results as using highest score.

The only disappointing result is for using average score as the dependent variable. The coefficient on buyer search cost is still positive but not significant. The reduction in variance caused by averaging likely accounts for the lack of statistical significance. The sign on scale is actually negative in this case. As averaging most affects the countries with the best real estate websites and the results for the highest score indicate that the best real estate websites are likely associated with larger countries, it can be inferred that averaging probably most affects the largest countries. If this is the case, it is not surprising that the coefficient on scale is not what was expected.

The results and their implications for the hypotheses laid out in Exhibit 3 are shown in Exhibit 8.

Exhibit 8 | Hypotheses vs. Results

Hypothesis	Results
Buyer search cost is an important factor in how the Internet will affect broker income and the demand for brokerage services.	Real estate brokers do provide more information on their websites if their prospective buyers have high search costs.
Economies of scale exist in providing information on a real estate website.	More information is provided on real estate websites in larger countries.
Real estate websites are particularly useful for vacation rentals.	More information is provided on real estate websites in countries with resort areas.
The Internet may lead to disintermediation of real estate brokers.	Real estate brokers do seem to take disintermediation into account when choosing how much information to provide on their websites.

Conclusion

This paper develops and tests a theoretical model that demonstrates the tradeoffs a broker faces in developing a website. A broker reduces the costs of providing information to the buyer by utilizing a website but may risk disintermediation if too much information is provided.

The theoretical model identifies a key factor determining how much information a real estate broker should provide on the Internet as the search costs of prospective buyers. As buyer search cost increases, a real estate broker can provide more information on the Internet while still avoiding disintermediation. This finding makes it clear that researchers and practitioners in real estate may need to go beyond assessing the direct benefits and costs of technological innovations such as the Internet. It may be equally important to consider indirect costs.

The empirical section of the paper investigates why real estate brokers in different countries provide different amounts of information on e-commerce websites. Testing reveals that the amount of information provided on a real estate broker's website does indeed depend on buyers' search cost. An additional finding consistent with the previous literature is that more information is provided on in real estate websites in larger countries and in countries with resort areas.

The empirical results imply that real estate brokers do take disintermediation into account when choosing how much information to provide on their websites. As much of the literature cautions, brokers must consider the potential of the Internet to reduce both their incomes and the demand for their services. The good news is that brokers appear to be heeding these cautions. Brokers around the world may already be considering Guttery, Baen and Benjamin's (2000) question about why

buyers and sellers should employ real estate brokers and Muhanna's (2000) warning that brokers may be underestimating the threat posed by the Internet for broker disintermediation. Full adoption of the Internet may be inevitable for brokers as many researchers suggest, but the pace of that adoption may very likely depend on whether the Internet is a substitute or a complement to brokerage services.

Appendix

	Websites per IRED Rating							
Country	0	1	2	3	4	5	Resort Dummy	GDP per Capita
Albania	0	0	1	0	0	0	0	3
Anguilla	0	0	2	0	0	0	0	8.2
Antigua / Barbuda	2	0	2	3	0	1	1	8.2
Antilles (Netherlands)	0	0	1	3	2	0	1	11.4
Armenia	0	0	0	1	0	0	0	3
Aruba (Netherlands)	0	1	0	1	2	0	1	28
Argentina	5	2	8	6	1	0	1	12.9
Australia	6	18	122	169	63	10	1	23.2
Austria	2	0	6	6	2	0	1	25
Bahamas	0	2	4	15	8	0	1	15
Bahrain	0	1	0	0	1	0	0	15.9
Bangladesh	0	0	0	0	0	0	0	1.57
Barbados	1	1	0	0	6	0	1	14.5
Belgium	0	2	13	11	7	1	1	25.3
Belize	3	0	6	10	5	1	1	3.2
Bermuda	0	0	1	2	1	0	0	33
Bolivia	0	0	1	1	0	0	0	2.6
Brazil	0	2	13	10	2	0	1	6.5
British Virgin Islands	0	0	2	4	2	0	1	16
Bulgaria	0	3	6	1	1	0	1	6.2
Canada	7	27	485	362	54	5	1	24.8
Cayman Islands (UK)	1	6	14	10	8	0	1	24.5
China	5	0	3	0	1	0	0	3.6
Chile	0	1	5	1	0	0	0	10.1
Columbia	0	0	1	1	1	0	0	6.2
Costa Rica	1	3	24	38	15	3	1	6.7
Croatia	0	0	5	7	2	1	1	5.8
Cuba	0	1	0	0	2	0	0	1.7
Cyprus	2	2	8	6	2	0	1	16
Czech Republic	0	4	10	9	2	0	1	12.9
Denmark	1	0	0	5	0	0	0	25.5
Dominica	2	0	1	3	0	0	1	4
Dominican Republic	4	2	11	7	4	0	1	5.7

Appendix (continued)

Country	Websites per IRED Rating						Resort Dummy	GDP per Capita
	0	1	2	3	4	5		
Ecuador	0	1	4	1	0	0	0	2.9
Egypt	0	1	2	1	1	0	0	3.6
El Salvador	0	0	1	2	1	0	1	4
Estonia	0	1	1	3	0	0	1	10
Fiji	1	0	4	4	1	0	1	7.3
Finland	2	0	1	0	0	0	0	22.9
France	0	6	64	85	16	4	1	24.4
Gambia	0	0	0	0	0	0	0	1.1
Germany	0	6	20	19	4	0	1	23.4
Ghana	0	0	0	0	0	0	0	1.9
Gibraltar	0	0	1	0	0	0	0	17.5
Greece	0	5	29	18	7	1	1	17.2
Greenland	0	0	1	0	0	0	0	20
Guatemala	1	0	1	2	0	0	1	3.7
Haiti	0	0	0	0	0	0	0	1.8
Honduras	1	0	4	5	4	0	1	2.7
Hong Kong	0	1	4	15	7	2	1	25.4
Hungary	1	5	13	6	2	1	1	11.2
Iceland	8	0	1	0	1	0	0	24.8
India	0	3	37	35	5	0	1	2.2
Indonesia	0	0	0	5	0	0	1	2.9
Israel	3	2	9	9	3	1	1	18.9
Ireland	0	3	36	30	10	0	1	21.6
Italy	1	9	38	33	14	0	1	22.1
Jamaica	0	1	3	7	1	1	1	3.7
Japan	1	2	14	14	6	0	1	24.9
Jordan	0	0	1	1	1	0	1	3.5
Kazakhstan	0	0	0	1	0	0	0	5
Kenya	0	1	1	2	1	0	1	1.5
Korea	0	3	4	6	0	0	0	16.1
Kuwait	0	0	1	0	0	0	0	15
Latvia	0	0	7	1	1	0	0	7.2
Lebanon	1	0	0	5	0	0	0	5
Liechtenstein	0	0	1	0	0	0	0	23
Lithuania	0	0	1	1	2	0	0	7.3
Luxembourg	2	0	0	0	0	0	0	36.4
Macedonia	0	0	1	0	0	0	0	4.4
Malawi	0	0	0	1	0	0	0	0.9
Malaysia	0	1	12	12	3	0	0	10.3
Malta	0	0	3	5	6	1	1	14.3
Mexico	1	8	66	66	14	2	1	9.1
Moldova	1	0	0	2	0	0	0	2.5

Appendix (continued)

Country	Websites per IRED Rating 0	1	2	3	4	5	Resort Dummy	GDP per Capita
Monaco	0	0	16	2	1	1	1	27
Montenegro	0	0	0	0	0	0	0	2.3
Morocco	0	0	1	0	1	0	1	3.5
Namibia	0	0	4	1	0	0	0	4.3
Netherlands	0	4	20	8	7	0	1	24.4
New Zealand	0	6	14	25	19	0	1	17.7
Nicaragua	1	0	0	6	0	0	1	2.7
Nigeria	0	0	0	1	0	0	0	0.95
Northern Ireland	0	0	6	3	3	0	0	21.6
Norway	3	0	1	2	0	0	0	27.7
Pakistan	0	1	3	1	0	0	1	2
Panama	0	2	1	0	2	0	1	6
Paraguay	0	1	1	0	0	0	0	4.8
Peru	0	0	0	1	0	0	0	4.6
Philippines	0	5	15	7	0	0	1	3.8
Poland	0	3	5	5	3	0	0	8.5
Portugal	0	1	13	14	0	0	1	15.8
Puerto Rico (US)	0	0	10	10	3	0	1	10
Romania	0	1	2	2	0	0	0	5.9
Russia	0	1	8	12	3	0	1	7.7
St. Lucia	0	0	0	3	0	0	1	4.5
Saudi Arabia	1	0	0	4	0	0	1	10.5
Serbia	0	0	2	0	0	0	0	2.3
Singapore	0	0	10	13	3	0	1	26.5
Slovakia	0	0	1	1	0	0	0	10.2
Slovenia	0	1	2	1	0	0	0	12
South Africa	0	7	35	35	7	0	1	8.5
Spain	2	2	39	58	19	1	1	18
Sri Lanka	0	1	1	3	0	0	1	3.3
Sweden	0	2	4	14	0	0	1	22.2
Switzerland	0	2	20	26	5	0	1	28.6
Taiwan	2	1	2	14	0	0	1	17.4
Tanzania	0	0	0	0	0	0	0	0.7
Thailand	0	4	17	27	2	2	1	6.7
Trinidad/Tobago	0	0	3	5	1	0	1	9.5
Turkey	0	2	10	10	2	1	1	6.8
Ukraine	1	2	4	6	0	0	1	3.9
United Arab Emirates	0	1	3	10	1	0	1	22.8
United Kingdom	1	2	39	55	22	15	1	22.8
U.S. Virgin Islands	1	0	6	11	3	1	1	15
Uruguay	0	0	2	3	0	0	0	9.3

Appendix (continued)

Country	Websites per IRED Rating 0	1	2	3	4	5	Resort Dummy	GDP per Capita
Vanuatu (Oceania)	0	0	0	0	0	0	0	1.3
Venezuela	0	0	4	4	3	0	1	6.2
Vietnam	0	0	0	1	0	0	0	2.0
Zimbabwe	0	0	2	0	0	0	0	2.5

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